Regularization and stabilization of port-Hamiltonian descriptor systems via output feedback

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Abstract

The structure preserving stabilization of (possibly non-regular) linear port-Hamiltonian descriptor (pHDAE) systems by output feedback is discussed. While for general descriptor systems the characterization when there exist output feedbacks that lead to an asymptotically stable closed loop system is a very hard and partially open problem, for systems in pHDAE representation this problem can be completely solved. Necessary and sufficient conditions are presented that guarantee that there exist a proportional output feedback such that the resulting closed-loop port-Hamiltonian descriptor system is (robustly) asymptotically stable. For this it is also necessary that the output feedback also makes the problem regular and of index at most one. A complete characterization when this is possible is presented as well.

References

 D. Chu and V. Mehrmann Stabilization of linear Port-Hamiltonian Descriptor Systems via Output Feedback, http://arxiv.org/abs/2403.18967